PROJECT facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Sequestration

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OPTIMAL GEOLOGICAL ENVIRONMENTS FOR CARBON DIOXIDE DISPOSAL IN SALINE AQUIFERS

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Background

For CO_2 sequestration to be a successful component of the U.S. emissions reduction strategy, there will have to be a favorable intersection of a number of factors, such as the electricity market, fuel source, power plant design and operation, a suitable geologic sequestration site, and a pipeline right-of-way from the plant to the injection site. The concept of CO_2 sequestration in saline water-bearing formations (saline reservoirs), isolated at depths below potable aquifers, became of widespread interest in the early 1990's and is in the process of maturing from a general concept to one of the options used by oil and gas producers for isolating excess produced CO_2.

The University of Texas at Austin's Bureau of Economic Geology is developing criteria for characterizing optimal conditions and characteristics of saline aquifers that can be used for long-term storage of CO_2. Phase I of this project included identifying drilling locations for CO_2 injection wells and better defining saline-formation conditions suitable for CO_2 disposal and sequestration. During Phase II, saline water-bearing formations outside of oil and gas fields were investigated.

Recent research and development efforts have demonstrated the technical feasibility of the process, defined costs, and modeled technology needed to sequester CO_2 in saline aquifers. One of the simplifying assumptions used in previous modeling efforts is the effect of stratigraphic complexity on transport and trapping in saline aquifers. Phase III efforts will include field testing of a limited amount of CO_2 injected into a deep saline reservoir within the state of Texas to ascertain the interaction of the gas with the reservoir rock and to monitor the size and shape of the CO_2 plume within the reservoir.

Primary Project Goal

This project will develop and then apply criteria for characterizing saline aquifers for long term sequestration of CO_2. Current effort is directed at a field test of injecting a set amount of CO_2 into a deep saline reservoir and monitoring the interaction of the gas with the reservoir and the dispersion of the CO_2 with time.

Objectives

- Provide an appropriate target site for development of expertise in design and performance assessment of CO_2 disposal facilities.

Optimal Geological Environments for Carbon Dioxide Disposal in Saline Aquifers

PROJECT PARTNERS

University of Texas at Austin

Texas American Resources

B-P America

Schlumberger

Bureau of Economic Geology

Austin Texas

Lawrence Berkeley National Laboratory

Lawrence Livermore National Laboratory

Oak Ridge National Laboratory

COST

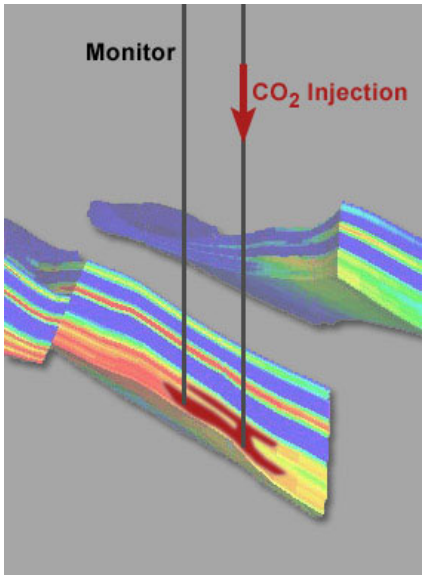
Total Project Value:	$3,659,215
DOE	$2,909,215
Non-DOE Share:	$ 750,000

- Adequately characterize the field site for CO_2 disposal in a saline reservoir.
- Monitor behavior and migration of the CO_2.
- Develop conceptual models for CO_2 behavior.
- Provide information needed to characterize conditions affecting long-term containment of CO_2.

Accomplishments

Phase I of the project plotted the distribution and 1996 CO_2 output of power plants in the U.S. Geologic screening criteria for identifying suitable saline water-bearing formations for CO_2 sequestration were developed. Sufficient data was obtained about the properties of saline water-bearing formations in the pilot test areas to develop a prototype Geologic Information System (GIS) to demonstrate the effectiveness of this approach. The pilot study confirmed that information is available, either as basin-specific data sets or as products of geologic analogs and play analysis. Efforts were focused on reservoir and geological play analyses and geologic and hydrologic models to extrapolate from areas with abundant data into water-bearing formations with little data to identify those saline water-bearing formations that have the geological attributes conducive to successful pilot sequestration projects.

Phase II involved a regional inventory of geological environments of saline water-bearing formations for CO_2 disposal. This effort was focused on reservoir and geological play analyses and geologic and hydrologic models to extrapolate from areas of abundant data into poorly known water-bearing formations and identified those parts of saline water-bearing formations that have the geological attributes conducive to ensuring success of pilot sequestration projects. Phase III effort will highlight through field test, the degree to which CO_2 can be injected in saline aquifers.



Conceptual model of sequestering CO_2 in saline aquifers.

Benefits

This project will benefit industry by extending modeling and monitoring capabilities for sequestration into the geologic settings where very large-scale sequestration is feasible in the geographic areas where sequestration is needed. Non-productive brine bearing formations below and hydrologically separated from potable water have been widely recognized as having high potential for very long term (geologic time scale) sequestration of greenhouse gasses, and this site will provide a first field scale testing in this setting. It will also provide a regional U.S. data inventory of saline water-bearing formations.